

U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Cicindela albissima*

COMMON NAME: Coral Pink Sand Dunes Tiger Beetle

LEAD REGION: Region 6

INFORMATION CURRENT AS OF: March 2010

STATUS/ACTION:

☐ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☐ Petitioned - Date petition received: **April 25, 1994**

☒ 90-day positive - FR date: **September 15, 1994**

☐ 12-month warranted but precluded - FR date:

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a) Is listing warranted (if yes, see summary of threats below)? **YES**

b) To date, has publication of a proposal to list been precluded by other higher priority listing actions? **YES**

c) Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (<http://endangered.fws.gov/>) provides information on listing actions taken during the last 12 months.

☐ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined): **November 15, 1994**

☐ Candidate removal: Former LPN: ☐

☐ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

☐ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a

proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

- ☐ F – Range is no longer a U.S. territory.
- ☐ I – Insufficient information exists on biological vulnerability and threats to support listing.
- ☐ M – Taxon mistakenly included in past notice of review.
- ☐ N – Taxon does not meet the Act’s definition of “species.”
- ☐ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Insect, Cicindelidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Utah

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Kane County, Utah

LAND OWNERSHIP: Over 90% of the species population occurs on Utah’s Coral Pink Sand Dunes (CPSD) State Park. The remainder of the species population occurs on adjacent Bureau of Land Management (BLM) managed public land.

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BIOLOGICAL INFORMATION

Species Description

The CPSD tiger beetle (*Cicindela albissima*) has striking coloration. The large wing cases (known as elytra) are predominantly white and much of the body and legs are covered in white hairs. The upper thorax has a metallic sheen and the eyes are particularly large. Adult beetles are 11 to 15 millimeters (0.4 to 0.6 inch) in size.

Taxonomy

The species was originally described as *Cicindela limbata albissima* (Rumpp 1961, p. 181). It shared the typical characteristics of other members of the *maritima* group (a group of closely related species of sand dune beetles) and was most similar in morphology to other subspecies of *C. limbata*. However, the species was distinguished on the basis of its unique expanded

maculation (spotted) pattern and its disjunct geographic distribution (Rumpp 1961, pp. 182-183). It was originally reported only at the CPSD State Park and is separated from its closest related subspecies by over 600 kilometers (km) (378 miles (mi)) (Rumpp 1961, p. 182).

The genetics of *C. l. albissima* were subsequently studied and revealed the CPSD tiger beetle was different from all other members in the *maritima* group, thus elevating it to a full species,

C. albissima. The study also showed that *C. albissima* was less closely related to the *C. limbata* subspecies than to several other species in the group (Morgan et al. 2000, p. 1111). The three other recognized subspecies of *C. limbata* range from mid-United States to Canada (Hill and Knisley 1991, p. 382). The ranges of these three subspecies and the CPSD tiger beetle do not overlap. They differ primarily in elytral maculation (spotted pigmentation of the wing cases).

Habitat and Life History

The CPSD tiger beetle appears to be isolated at a high elevation, and, like other members of the *maritima* species group, is restricted to a cool, sandy habitat. The species is restricted mostly to a relatively small part of an approximately 13 km (8 mi) long dune field at CPSD State Park, situated at an elevation of about 1,820 meters (m) (5,970 feet (ft)).

Adult CPSD tiger beetles use habitats ranging from the swales between the dunes to the upper slopes. They are active predators, attacking and eating prey with their large and powerful mandibles. These beetles are active during the day, preying and scavenging on live and dead insects. At night, the beetles bury into the sand dunes (Conservation Committee 1997, p. 4).

Larval CPSD tiger beetles inhabit inter-dunal swales, typically dominated by the leguminous plants *Sophora stenophylla* (silvery sophora) and *Psoraleidum lanceolatum* (dune scurfpea), and several grasses, including *Sporobolus cryptandrus* (sand dropseed) and *Achnatherum hymenoides* (Indian ricegrass). Larvae also are closely associated with a federally threatened plant species, *Asclepius welshii* (Welsh's milkvetch). Swales are more productive micro-habitats than the surrounding sand dune slope habitat of the adults. Larvae inhabit individual burrows within the furrows of the dune system; from here they are able to ambush small invertebrate prey. The CPSD tiger beetle larvae take 2 years to mature to adults (Knisley and Hill 2001, p. 388). Adult stages may appear in the fall and overwinter, but the majority appears in March and they die off shortly after mating in May and July. The microhabitat requirements that correlate with survivorship for this species are unclear, although the beetle is most common in the midsection of the dunes, in the transition zone between the dynamic southern end and the more stabilized northern end. This area also has the highest elevation (Knisley and Gowan 2006, p. 18). Soil moisture seems particularly important. The areas with the highest moisture also contain the most individuals (Knisley and Gowan 2008, p. 10). As a result, productive habitat for this species occurs in a highly patchy mosaic where lightly vegetated swale edges meet the dune slopes.

Movement of the swales due to sand dune movement and vegetative succession naturally occurs in this system. Dune movement can result in a decline in suitable habitat conditions within designated protected areas (Knisley and Gowan 2008, pp. 21-22). Tiger beetles appear to prefer a mid-succession vegetative habitat as they are excluded from areas with no vegetation and very dense vegetation.

Range and Distribution

The CPSD tiger beetle is known to occur only in sand dunes approximately 11 km (7 mi) west of Kanab, Kane County, in south-central Utah. Historical range is unknown, but is likely similar to the species' current range due to the absence of other high-elevation sand dune habitat (Knisley and Hill 2001, p. 390). The CPSD State Park is likely the only suitable habitat for the species

within the entire region. Only one historical record exists of this species outside of the CPSD State Park, at Mt. Carmel Junction (Knisley and Hill 2001, p. 382). This individual may have been dispersing and does not indicate a range extent outside of the CPSD State Park (Knisley and Hill, p. 390).

The CPSD State Park's geologic feature that the tiger beetle inhabits is approximately 1,416 hectares (ha) (3,500 acres (ac)). The northern 607 ha (1,500 ac) is managed by the BLM Kanab Resource Area and is within the Moquith Mountain Wilderness Study Area (WSA). The southern 809 ha (2,000 ac) of the dunes is within the Utah's CPSD State Park. The species' range is approximately 20% of the sand dunes and occurs in a patchy distribution. The northern patch of the sand dunes is uninhabitable due to the presence of late-succession vegetation. The southern end of the sand dunes also is uninhabitable, due to the presence of high winds and high mobility of the sand dunes.

Designated conservation areas were established in spring 1998 to protect the CPSD tiger beetle habitat from off-road vehicle (ORV) use. These conservation areas occur on State Park and BLM lands:

- 1) 84 ha (207 ac) are closed to ORV use within the CPSD State Park and constitutes the core beetle habitat; and
- 2) 150 ha (370 ac) are closed to ORV use on BLM land and harbor a very small population of CPSD tiger beetles.

Over 90% of the CPSD tiger beetle's adult and larval populations are restricted to the conservation area on state land. The second protected conservation area is on BLM managed lands about 4.8 km (3 mi) north of the CPSD tiger beetle's main occupied habitat. This site has three known larval beds and a very small group of adults (Conservation Committee 1997, pp. 17-18). No other sites of CPSD tiger beetle occurrence are known outside of the CPSD State Park despite thorough searches; researchers are confident that no other populations are present (Knisley 2006, p. 1).

Status of the Species

Population estimates from 1992 to 1998 were calculated using a mark/recapture method. Since 1998, population estimates of adults are based on a removal method. Studies were conducted in 2004 to compare the results of mark/recapture population estimate methods with the removal methods. The work involved assessing movement, adult burrowing, and other factors that affect results of estimation. Significant numbers of adults move over a several day period, resulting in population overestimates by a factor of 4.0 to 4.8 times when using the mark/recapture method. As a result, the 1992 to 1998 estimates of adult population size were significant overestimates (Knisley and Gowan 2005, p. 5).

Abundance over time was evaluated based on data collected since 1997 in all swales between sand dunes (Knisley and Gowan 2009, p. 5). There is substantial year-to-year population variation (FIGURE 1), which is typical of many desert arthropods that are greatly affected by climatic factors, especially rainfall (Knisley and Hill 2001, p. 391). As previously described, population estimates in 1992-1998 are considered overestimates, while those from 1999-2008 provide more reliable estimates.

Adult abundance in any year is related to the recruitment of new individuals 2 years previous (because of a 2-year life cycle) and the survivorship of the developmental stages of that cohort (Conservation Committee 1997, p. 5). Populations in 2002 were the highest ever recorded (2,944) with very large populations in core habitat swales. One year later, in 2003, populations were the lowest ever recorded (595). This decline in the population is likely a result of drought in 2001 (Knisley and Gowan 2005, pp. 5-6). Populations have increased somewhat from this low, but remain well below average.

Rainfall may have a positive effect on oviposition (recruitment) and survivorship (Knisley and Hill 2001, p. 391). Soil moisture increases larval activity, oviposition, and attracts adults. For example, artificial watering of natural burrows in May and June increased survival of the larvae by 10% (Knisley and Gowan 2006, p. 7). Because 2005 was a wet year, the population grew slightly to 1,124 in 2008 (up from 700 in 2007) (Knisley and Gowan 2009, p. 5) (See FIGURE 2 for rainfall measurements). However, the correlation between rainfall and population is indirect because rainfall indirectly affects a number of population parameters, including oviposition rate, recruitment, growth, prey populations, and overall survival. Further field studies investigating the relationship between rainfall, soil moisture, and population are required in order to predict future population trends (Knisley 2009).

FIGURE 1. The number of adult beetles captured (Index Count) and the estimated size of the entire population based on numbers caught and type of survey (Total Estimate).

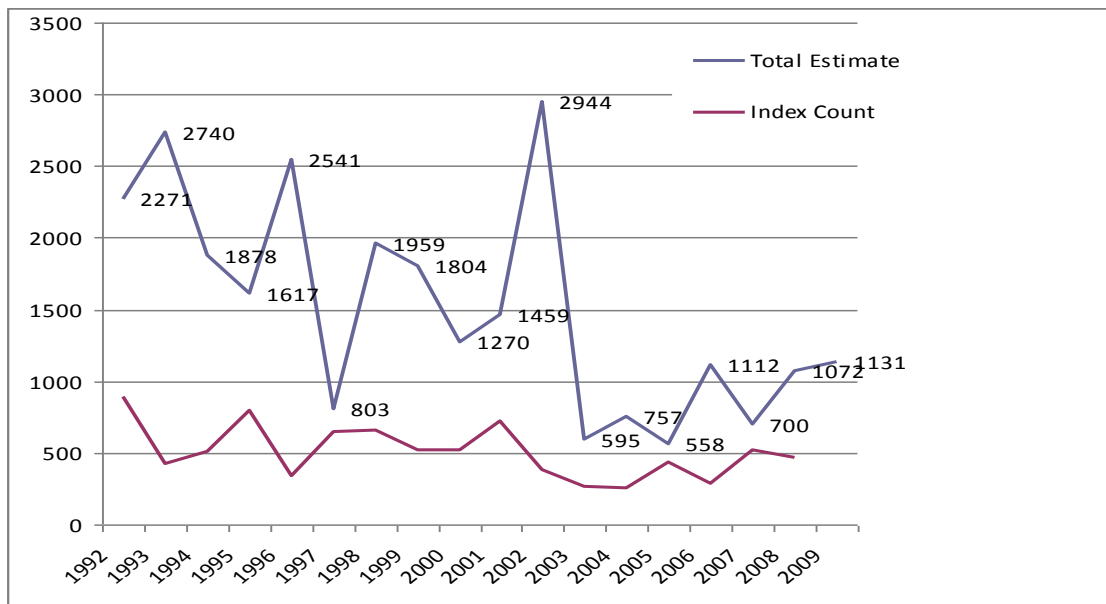
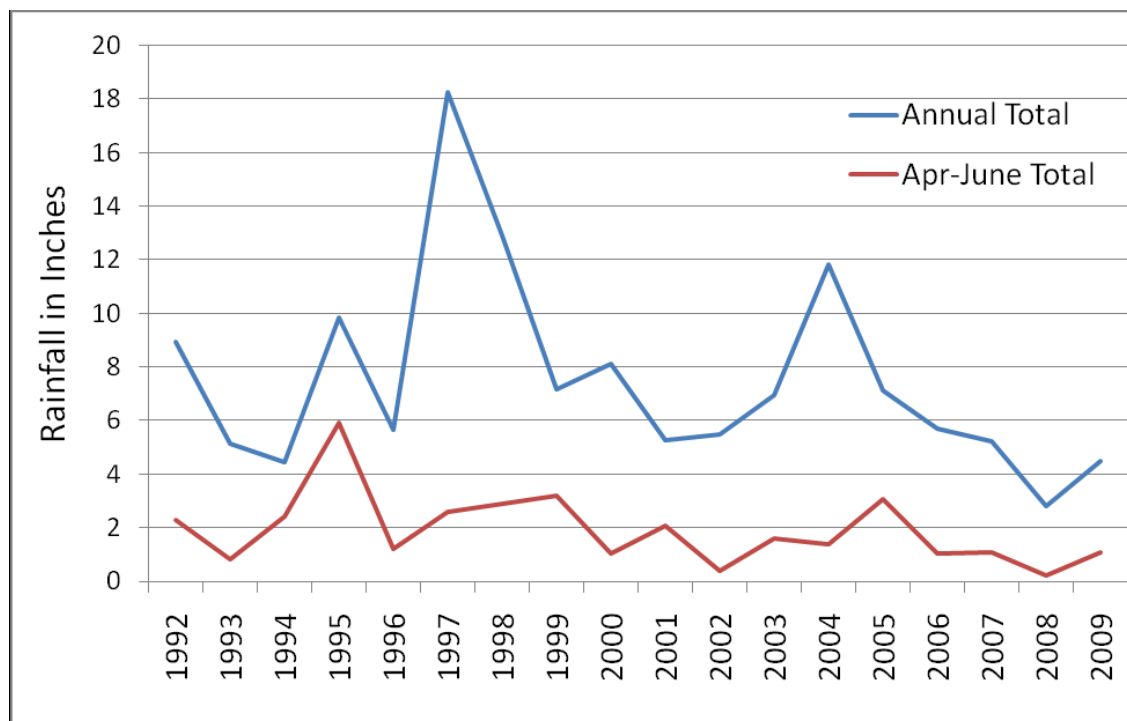


FIGURE 2. Total rainfall for April through October and April through June (in inches) at Kanab, 1992-2009.



A population viability analysis (PVA) at the current level of population growth indicates a 32% chance of extinction within a hundred years (Knisley and Gowan 2009, p. 17). The PVA model included four factors:

- starting population size,
- growth rate,
- stochasticity (a measure of variability in the environment), and
- carrying capacity.

Increasing population growth by 30% would reduce chances of extinction to 0.001% (Knisley and Gowan 2009, pp. 17-18). Varying carrying capacity had very little effect on the risk of extinction, whereas decreasing environmental stochasticity greatly reduced chances of extinction (Knisley and Gowan 2009, p. 18).

In the early 1990s a conservation committee was formed with the goal of protecting the CPSD tiger beetle and balancing its needs with that of ORV use. A Candidate Conservation Agreement and Strategy (CCA) (Conservation Committee 1997) was developed to conserve the CPSD tiger beetle. The CCA's primary goal of establishing self-sustaining or expanding populations has not been achieved (Knisley and Gowan 2005, p. 7; 2008, p. 14). Despite increased ORV management and restrictions since 1997, the population has not had a corresponding increase (see FIGURE 3, Threats section).

THREATS

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

The CPSD State Park provides the only known habitat for the CPSD tiger beetle. The ORV activity occurs in CPSD State Park. This activity has destroyed and degraded the beetle's habitat; especially the inter-dunal swales used by the larval population (Knisley and Hill 2001, p. 392-393). Because ORV use predates any survey information, it is unknown how much habitat was lost.

Adult beetles are killed by ORVs, but more important impacts may be damage to vegetation, reduction in arthropod prey, and disturbance and increased desiccation of larval microhabitat (Knisley and Gowan 2006, pp. 20-21). The inter-dunal swales are the most biologically productive areas in this ecosystem and have the greatest abundance of suitable prey species.

The BLM and State Parks have monitored ORV impacts to the majority of the species' habitat since 1998, enforced ORV restrictions, and designated Conservation Areas (ORV closure areas) to protect core beetle habitat areas by excluding ORV use (Knisley and Hill 1997, pp. 6-7; 2001, p. 10; Knisley 2000, p. 10; 2002, p. 12).

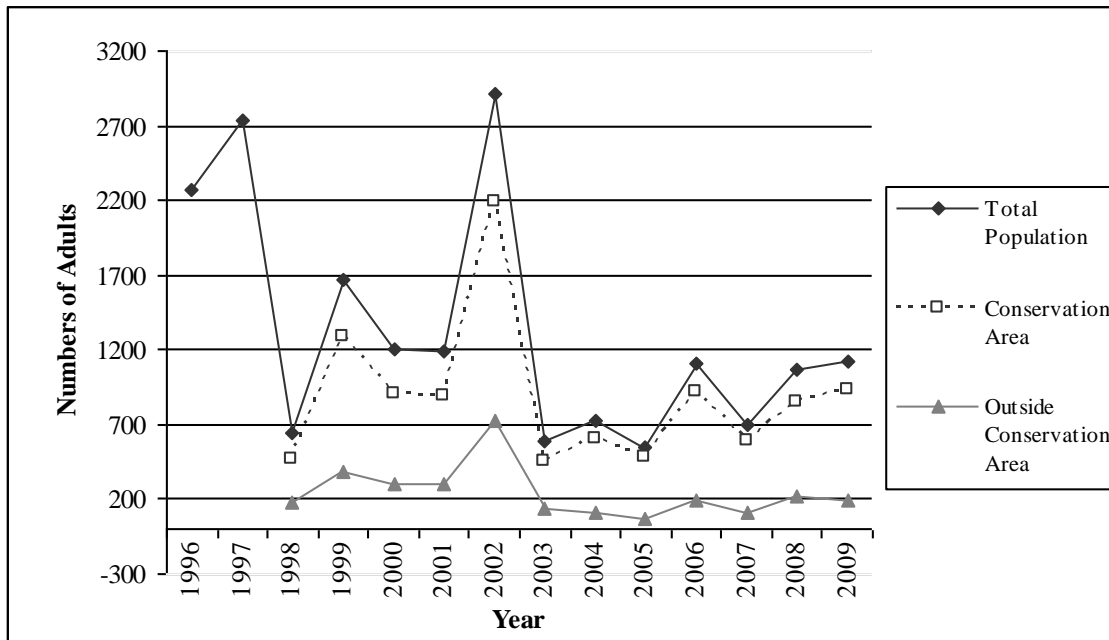
Approximately 668 ha (1,650 ac) in the CPSD State Park and 445 ha (1,100 ac) in the BLM managed WSA are open to ORV use. However, over 90% of the known beetle population now resides within ORV closure areas on State Park and BLM lands. In most years, 98% of the adult CPSD tiger beetle population lies within an 84-ha (207-ac) CPSD State Park conservation area, which is closed to ORV use. An additional 55 ha (137 ac) east of the conservation areas were restricted for use only as a travel corridor for ORVs. The northern conservation area on BLM land includes 150 ha (370 ac) protected from ORV use for the CPSD tiger beetle. A greater percentage of beetles are found outside of the conservation area only in years of very high numbers, presumably when the carrying capacity of that area is reached (Knisley 2009; Knisley and Hill 2001, p. 10).

The Conservation Areas were selected to include the most densely populated swales. A limited number of swales outside the conservation area do support the beetle. These swales are in the ORV travel corridor area, a narrow area that serves to connect two ORV play areas north and south of CPSD State Park conservation areas. As a travel corridor, this area receives only a moderate amount of traffic. The majority of traffic is concentrated in the play areas, and ORV use in these areas has no direct impact on the tiger beetle. The play areas have never been observed to support beetles, and likely did not have suitable habitat prior to ORV use due to vegetative succession, high winds and dune movement. Therefore, ORV use is likely only directly impacting the areas immediately surrounding the Conservation Areas.

Although 234 ha (577 ac) out of approximately 1,416 ha (3,500 ac) is protected from ORV use, the CPSD tiger beetle population has not had a significant increase (FIGURE 3). The observed changes appear to be primarily due to natural population fluctuations in response to drought. We also lack data previous to the establishment of conservation areas (Knisley and

Gowan 2009, p. 11) (see Factor E). The CPSD tiger beetles have occasionally expanded into habitat northeast of the conservation area in the CPSD State Park during periods of population growth (Knisley and Hill 2001, pp. 391, 392; Knisley 2009).

FIGURE 3. Population inside and outside conservation areas. Conservation areas were established in 1998.



The ability for CPSD tiger beetles to expand their range is considered limited because only a very small portion of the sand dunes is suitable. The ORV use continues to modify habitat adjacent to the Conservation Areas, affecting already limited habitat. Although increasing protected habitat may increase the overall carrying capacity of the habitat, this factor had little influence on the risk of extinction in the latest population viability analysis (Knisley and Gowan 2009, p. 5). We recognize the limitations of the population viability modeling, which may not fully capture the effects of drought. Increasing protected habitat may have a moderating effect on environmental stochasticity (including drought). However, the amount of additional suitable habitat is small, approximately 8.1 ha (20 ac). In addition, increasing the protected Conservation Areas is unfeasible for BLM and State Parks to meet their multiple-use mandates. Therefore, this is not currently a viable option for reducing the effects of ORV use.

In summary, ORV use in unprotected areas may be a limiting factor to the species range expansion in times of high population numbers. We consider ORV use a threat to beetles outside the conservation area; however, we do not believe that additional ORV management would have a significant positive impact on this species given the small amount of overall habitat it impacts (Knisley and Gowan 2009, p. 22). The long-term recovery of CPSD tiger beetles may be more dependent on environmental factors such as drought (see Factor E). Adequate precipitation would increase the productivity and suitable habitat inside the conservation areas, which would likely be enough to support the species successfully.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The subspecies may be vulnerable to uncontrolled over-collection by professional and hobby tiger beetle collectors. Tiger beetles are second only to butterflies among the insects that are desirable objects of natural history collections (Knisley and Hill 1995). The species was collected, heavily at times, since its discovery and publication of the species' description (Rumpp 1961 entire; Knisley and Hill 1994, 1995). Collection of adults, before they mate and lay their eggs, may severely reduce the population's reproductive capacity. Some collection may be legitimate, adding valuable knowledge of biogeography, taxonomy and life history of the species, but this activity is controlled. Restrictions on collecting are enforced by State Park and BLM personnel. Quantifying this threat is difficult, but at this time it is not considered to be of high magnitude, due to the low number of observed collectors (Knisley 2005, pers. comm.).

C. Disease or Predation

Natural mortality through predation and parasitism accounts for some population loss of both adult and larval CPSD tiger beetles (Knisley and Hill 1994, p. 16). Natural predators to adult CPSD tiger beetles are few, but include robber flies (Asilidae), which are common at the CPSD State Park. Robber flies capture tiger beetles while in flight. Larval CPSD tiger beetles have two known natural predators.

Bee flies (Bombyliidae) are known to flick their eggs into beetle burrows. When the eggs hatch, the larvae parasite feeds on beetle bodily fluids, often resulting in death of the tiger beetle larvae.

Wasps of the genus *Methoca* parasitize the CPSD tiger beetle larvae (Knisley and Hill 1995, p. 14). When the egg hatches, the wasp larva consumes the tiger beetle larvae. Levels of parasitism are low at the CPSD State Park and not likely to limit populations (Conservation Committee 1997, p. 7).

Although predation affects individuals, we have no evidence that predation is a threat to the species.

D. The Inadequacy of Existing Regulatory Mechanisms

No state laws in Utah provide protection to insects. However, the land management entities in the range of the species (i.e., BLM, State Parks) have provided protected mechanisms for the species.

The CPSD State Park's geologic feature is approximately 1,416 ha (3,500 ac). The southern 809 ha (2,000 ac) of the dunes is within the CPSD State Park and is categorized as public land with a recreational emphasis. The northern 607 ha (1,500 ac) is Federal land managed by the BLM Kanab Resource Area with a rangeland emphasis (BLM 2000, p. 14). This area is partly within the Moquith Mountain Wilderness Study Area (WSA). Most of the Moquith Mountain is designated as a WSA for watershed protection. Wilderness designation protects occupied tiger beetle habitat by restricting ORV use. Both BLM and State Park regulations prohibit harassment or collection of wildlife, plants, or geological or archaeological remains. Public education for both areas includes signage, brochures, and interpretive programs.

The BLM Kanab Field Office completed a resource management plan in 2008. This plan (BLM 2008, p. 32) included continued implementation of conservation actions per the CCA for the CPSD tiger beetle, management of ORV use, and coordination of management with the State of Utah and the CPSD State Park (65 FR 2000).

We renewed the CCA in 2009 (Conservation Committee 1997, 2009). Although the CCA is not a regulatory document, we are working with our partners to implement conservation actions identified. The CCA is a collaborative effort between state, federal, and county agencies to implement conservation objectives and actions to protect and recover the tiger beetle within the CPSD State Park. Conservation actions defined in the CCA include the formation of two conservation areas to maintain and protect tiger beetle populations in the CPSD State Park geologic feature.

The first conservation area is in the CPSD State Park, and contains the bulk of the tiger beetle population. Of the 809 ha (2,000 ac), 84 ha (207 ac) are closed to ORV use to provide protection for the core tiger beetle habitat. The protected area is defined by signs placed 6 m (20 ft) apart around the perimeter of the habitat. Protection for the tiger beetle is enforced according to the CPSD State Park's special closure and restrictions (R615-633-2 "1"). The CPSD State Park's officers patrol the area daily during times of high recreational use (Slater 2006). An additional 55 ha (137 ac) function as an ORV travel corridor between the open areas in the CPSD State Park and BLM land. The remaining 670 ha (1,656 ac) of the CPSD State Park provides no protection for the beetle.

A second conservation area is managed by BLM, and includes 150 ha (370 ac) closed to ORV use to protect a smaller known population of the tiger beetle. Approximately 445 ha (1,100 ac) is available for ORV use, but with the stipulation that ORVs stay on open dunes and maintain a 3 m (10 ft) buffer around vegetation. Enforcement is minimal and primarily relies on voluntary compliance (Conservation Committee 1997, p. 13).

Only 10 to 20% of CPSD tiger beetles occur outside these conservation areas during most years. They occupy approximate 8.1 ha (20 ac) of additional habitat where ORV use is permitted. Expansion of CPSD tiger beetles into new habitats may be limited by habitat modification and destruction resulting from ORV activity (Knisley and Gowan 2008, p. 22). This threat is difficult to quantify as ORV use was permitted in all areas before surveys began. During years of low population numbers, beetles concentrate in the protected area, probably because it contains the most suitable microhabitat (Knisley and Gowan 2005, p. 4). It is unknown if increasing protected areas will provide much of a benefit because the swales outside the conservation areas contain less ideal microhabitat conditions (Knisley 2009b). This may be due to ORV use or just inadequacy of existing habitat.

An additional complication to managing the protected habitat is movement of the swales due to dunal shifts. Dune movement can result in a decline in suitable habitat conditions within the designated protected areas (Knisley and Gowan 2008, pp. 21-22). To effectively manage conservation areas, boundaries should be reviewed and evaluated periodically. Monitoring of the population and its threats is a major objective of the conservation agreement, and this includes reviewing of conservation area boundaries. Twelve years after the conservation boundaries were established, the tiger beetle core habitat is still well protected. Dune movement is highly

variable and unpredictable. Between 2001 and 2002 major dune ridgelines showed up to 22 m of movement, but little movement has occurred since (Knisley and Gowan 2005, p. 4). This vulnerability makes it difficult to estimate the amount of habitat necessary to compensate for this factor. Despite some good measures, the CPSD tiger beetle is still at low numbers that are a cause for concern. However, there are no further regulatory mechanisms that are likely to have an impact on species numbers, and it is unlikely that any options for regulatory mechanisms could adequately address this threat.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

The CPSD State Park is a unique habitat in the region with high elevation sand dunes (1,820 m/5,907 ft). Given their high elevation, these sand dunes likely experience more precipitation when compared with nearby low elevation sandy habitats. Therefore, we assume the species has evolved in a relatively wet environment. Drought conditions since 2001 resulted in reduced habitat availability and very low recruitment to the population. Soil moisture seems to have the greatest effect on oviposition and larval survival. A wet year in 2005 produced a slight population increase 2 years later (FIGURE 1). Several wet years in a row may be necessary to significantly increase the tiger beetle population. In times of drought, the overall habitat availability on the dunes is much reduced. During years of low population numbers, beetles concentrate in the protected area (Knisley and Gowan 2005, p. 4), so increasing protected areas may help support refuge populations of the beetle during times of drought. However, the effectiveness of this strategy is dependent on several factors, including suitability of additional protected habitat and the ability of the species to recover enough to colonize the new habitat. Rainfall is the primary, but indirect factor controlling population size and the changing dynamics of this species (Knisley and Gowan 2009, p. 8); therefore, drought is the most severe threat this species faces.

Drought is a localized, prolonged shortage of precipitation. Drought can be intensified or mediated by climate change, a change in global climate and weather patterns. Climate change will likely impact the CPSD tiger beetle. If climate change results in more intense drought conditions, the existence of the tiger beetle may be further threatened. However, the weather patterns created by climate change are unpredictable, and effects to rainfall are particularly difficult to predict (Steenburgh et al. 2007, p. 6; Smith et al. 2001, p. 224). Changes in rainfall around the west have varied depending on location. Many parts of Utah have become warmer and wetter, whereas areas in Arizona have witnessed a decrease in rainfall (Smith et al. 2001, p. 220). The CPSD State Park is a high elevation location between these two areas, making predictions even more difficult. Utah as a whole is expected to see periods between precipitation events increase, while those precipitation events become more intense (Steenburgh et al. 2007, p. 6). It is difficult to predict the effects such a weather pattern would have on this species. In addition, spring rainfall totals (March-June) have a greater correlation with population levels than total yearly rainfall (Knisley and Gowan 2006, p. 7). If more intense rainfall events occur during this period, the species may benefit. However, if the precipitation events occur too infrequently, or at the wrong time of year, drought conditions will further depress the species. Because of these uncertainties, we cannot reliably assess the threat of climate change to the species at this time.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

A CCA (Conservation Committee 1997) was signed in 1997 and is being implemented. Development of the CCA was a collaborative effort by the Utah Department of Natural Resources, which oversees State Parks and the Division of Wildlife Resources, the BLM, the U.S. Fish and Wildlife Service, and the Kane County Commissioner. The CCA includes recommended conservation objectives and actions designed to protect and recover the CPSD tiger beetle. A CCA Technical Committee was established to coordinate management activities for the tiger beetle. The committee meets on an informal basis to evaluate management actions and needs. In 2009, the committee updated the CCA to incorporate new scientific information learned about the CPSD tiger beetle over the past 12 years and to update management goals.

The CPSD tiger beetle is monitored on a yearly basis. This effort was initiated in 1992. Research continues on tiger beetle life history and biology as a part of the annual monitoring (Knisley and Gowan 2008, 2009). Additional studies will be added starting in 2010 to determine the microhabitat requirements that lead to the best adult recruitment.

The BLM and State Park personnel have promoted public awareness and conservation of the CPSD tiger beetle. Visitors to the sand dunes and other interested persons have access to two brochures prepared by State of Utah's Division of Park and Recreation on the tiger beetle. The State Park has posted tiger beetle interpretation signs at various locations at the dunes.

SUMMARY OF THREATS

The CPSD tiger beetle is known to occur only at the CPSD State Park, about 11 km (7 mi) west of Kanab, Kane County, in south-central Utah. The CPSD State Park encompasses 1,416 ha (3,500 ac) but the beetle is currently restricted to a small portion of that habitat (234 ha/577 ac of protected habitat), probably due to specific microhabitat requirements, and possibly ORV use (Kinsley and Gowan 2006, p. 18).

Existing habitat may be temporarily declining in quality due to vegetation succession. The occupied swales containing the CPSD tiger beetles are subject to dunal shifts. Dune movement can result in a decline in suitable habitat conditions within the conservation areas, although total movement is highly variable and unpredictable (Knisley and Gowan 2008, p. 21-22). To be effective, conservation area boundaries should be periodically evaluated and altered to maintain habitat protected from ORV activity. Recreational ORV use in protected beetle habitat areas is prohibited by both the Utah Department of Parks and Recreation and the BLM. An approximate 13-km (8-mi) long dune field was established as the CPSD State Park in 1963, to serve as access to the dunes for recreation, and, ostensibly, to protect the dune resources. However, ORV recreational activity has destroyed and degraded habitat outside the protected area, especially the most productive inter-dunal swales. Because ORV use predates any survey information, it is unknown how much habitat was lost. Although conservation areas were established in 1997 to protect the known area occupied by the CPSD tiger beetles, population expansion into additional suitable habitats outside the conservation areas may be restricted by habitat modification and destruction resulting from ORV activity or habitat unsuitability.

Drought is negatively affecting the CPSD tiger beetle populations (Knisley and Gowan 2009, p. 9). The CPSD State Park was in a drought from 2001 to 2005, and rainfall has declined again since 2006. Drought has a severe effect on soil moisture, reducing total habitat as well as affecting prey base. Drought may be increased in future years by the effects of climate change. Drought may play a larger or cumulative role in the species distribution and range expansion ability. Rainfall is the primary indirect factor controlling population size and the changing dynamics of this species (Knisley and Gowan 2009, p. 8); therefore, drought is the most severe threat this species faces.

RECOMMENDED CONSERVATION MEASURES

Because the greatest threat this species faces is drought, there are limited options available for conservation of the species. Most importantly, the impact of supplemental watering on survival and total population should be investigated. Translocation of beetles to suitable habitat areas should be investigated as a potential conservation measure.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

RATIONALE FOR LISTING PRIORITY NUMBER

Magnitude: High

This species is restricted to one small population threatened by drought conditions. Tiger beetle population levels are closely tied to rainfall. The species' population remains small, and does not appear to be improving despite management efforts. Land management agencies are carrying out prescriptions described in the CCA to provide areas protected from ORV use, increased public awareness, and further our knowledge of the species through research.

In addition, the species' habitat is impacted by ORV use. Population expansion into additional suitable habitats outside the conservation areas is limited by habitat modification and destruction resulting from ORV activity. Tiger beetle populations may be threatened if they are unable to persist in refuge habitats during unfavorable environmental conditions, such as drought.

The ongoing threat from drought, in tandem with ORV activity, continues to cause steady declines in the tiger beetle population, and the magnitude of these combined threats is high. Ongoing monitoring and research has documented that conservation measures have failed to lessen population declines. Based on this assessment, we conclude that the magnitude of threats to the CPSD tiger beetle is high.

Imminence: Imminent

The threat to the species is imminent because it is a narrow endemic and is intrinsically vulnerable to climatic factors such as drought, and ORV use restricts the species' range. The ORV use is ongoing within the CPSD State Park, particularly in areas immediately adjacent to known occupied habitats. The area has experienced drought conditions in later years and climate change models indicate this may increase in future years. Based on the ongoing nature of threats to this species, we conclude that they are imminent.

Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? YES

Is Emergency Listing Warranted? NO. The CCA and implementing Conservation Committee continue to provide some level of protection and management direction for the CPSD tiger beetle.

DESCRIPTION OF MONITORING

The tiger beetle continues to be monitored on a yearly basis by Dr. Barry Knisley of Randolph-Macon College. Dr. Knisley's studies have documented changes in the tiger beetle populations since 1992. Prior to 1999, methods of estimating population size by the mark-recapture method resulted in an over-estimation of population size, especially when compared to the removal method used since then (Knisley and Gowan, 2005, pp. 13-14). These concerns were addressed and apparently corrected. The CCA goal of showing self-sustaining or expanding populations has not yet been achieved. Overestimates of adult numbers from 1992 to 1998 influenced an unrealistically high target of 2,000 adults, which needs to be reevaluated (Knisley and Gowan 2006, p. 11).

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment--Utah.

Indicate which State(s) did not provide any information or comments—Not applicable.

LITERATURE CITED

- Bureau of Land Management. 2000. Vermillion Management Framework Plan Amendment Proposed Management Plan and Alternatives. BLM Kanab Field Office, Coral Pink Sand Dunes State Park. Environmental Assessment. April 2000. 136 pp.
- Bureau of Land Management. 2008. Record of Decision and Approved Resource Management Plan. BLM Kanab Field Office. October 2008. 172 pp.
- Conservation Committee for the Coral Pink Sand Dunes Tiger Beetle. 1997. Conservation Agreement and Strategy for the Coral Pink Sand Dunes Tiger Beetle (*Cicindela limbata albissima*). Prepared by Members of the Conservation Committee for the Coral Pink Sand Dunes Tiger Beetle, March 31, 1997. 62 pp.
- Hill, J.M., and C.B. Knisley. 1991. Current status survey and biological studies *Cicindela dorsalis* and *C. puritana* in Maryland, 1990. Interim report to Maryland Department of Nat. Res., Natural Heritage Program, Annapolis, Maryland, and U.S. Fish and Wildlife Service, Annapolis Field Office. 69 pp.
- Knisley, C.B. 1999. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela limbata albissima*, 1998 Studies. Report to the U.S. Fish and Wildlife Service.
- Knisley, C.B. 2000. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela limbata albissima*, 1999. Report to the U.S. Fish and Wildlife Service.
- Knisley, C.B. 2001. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela limbata albissima*, Year 2000, Final Report. Report to the U.S. Fish and Wildlife Service.
- Knisley, C.B. 2002. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela limbata albissima*, Year 2001, Final Report. Report to the U.S. Fish and Wildlife Service.
- Knisley, C.B. 2006. Email to Marianne Crawford on tiger beetle populations at CPSD. January 2006.
- Knisley, C.B. 2007. Email to Marianne Crawford on tiger beetle populations at CPSD. March 2007.
- Knisley, C.B. 2009b. Email to Katherine Richardson on tiger beetle conservation areas and possible expansion. May 2009.
- Knisley, C.B., and C. Gowan. 2003. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela limbata albissima*, Year 2002, Final Report. Report to Bureau of Land Management. 26 pp.

- Knisley, C.B., and C. Gowan. 2005. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela limbata albissima*, Year 2004, Final Report. Part I. Population and habitat studies in 2004. Part II. Monitoring C. albissima, 1995-2005. Part III. Evaluating methods to monitor abundance of the Coral Pink Sand Dunes Tiger Beetle. Report to Bureau of Land Management. 27 pp.
- Knisley, C.B., and C. Gowan. 2006. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela albissima*: Year 2006 Results and review of all studies, 1992-2006. Report to Bureau of Land Management. 21 pp.
- Knisley, C.B., and C. Gowan. 2008. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela albissima*: Year 2007 Results and a review of previous studies, 1992-2007. Report to Bureau of Land Management. 25 pp.
- Knisley, C.B., and C. Gowan. 2009. Biology and conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela albissima*, Year 2008, Final Report. Report to Bureau of Land Management. 23 pp.
- Knisley, C.B., and J.M. Hill. 1994. Coral Pink Sand Dunes Tiger Beetle, *Cicindela limbata albissima* Current Status and Biology. Unpublished Status Report on file with the U.S. Fish and Wildlife Service and Bureau of Land Management. Salt Lake City, Utah. 36 pp.
- Knisley, C.B., and J.M. Hill. 1995. Biological Studies of the Coral Pink Sand Dunes Tiger Beetle, and Surveys for other Rare Beetles in Utah, 1994. Unpublished Status Report on file with the U.S. Fish and Wildlife Service and Bureau of Land Management. Salt Lake City, Utah. 43 pp.
- Knisley, C.B., and J. M. Hill. 1997. Studies of the Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle. Report to Bureau of Land Management.
- Knisley, C.B., and J.M. Hill. 1998. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela limbata albissima*, 1997 Studies and a Review of Previous Research. Report to the U.S. Fish and Wildlife Service.
- Knisley, C.B., and J.M. Hill. 2001. Biology and Conservation of the Coral Pink Sand Dunes Tiger Beetle, *Cicindela limbata albissima* Rumpp. Western North American Naturalist 61(4):381-394.
- Morgan, M., C.B. Knisley, and A.P. Vogler. 2000. New Taxonomic Status of the Endangered Tiger Beetle *Cicindela limbata albissima* (Coleoptera: Cicindelidae): Evidence from mtDNA Annals of the Entomological Society of America 93:1108-1115.
- Rumpp, N.L. 1961. Three new tiger beetles of the genus *Cicindela* from southwestern United States (Coleoptera-Cicindelidae). Bull. So. Calif. Acad. Sci. 60:165-187.

Slater, C. 2007. Email to Marianne Crawford concerning enforcement of CPSD beetle habitat. March 2007.

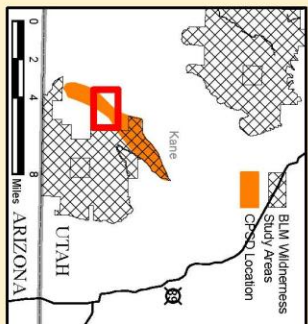
Smith, J.B., R. Richels, and B. Miller. 2001. Chapter 8: Potential Consequences of Climate Variability and Change for the Western United States *in* Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change. A Report of the National Assessment Synthesis Team, U.S. Global Change Research Program.

Steenburgh, J., et al. 2007. Climate Change and Utah: The Scientific Consensus. Blue Ribbon Advisory Council on Climate Change Report to Governor Jon M. Huntsman, Jr. October 3, 2007.

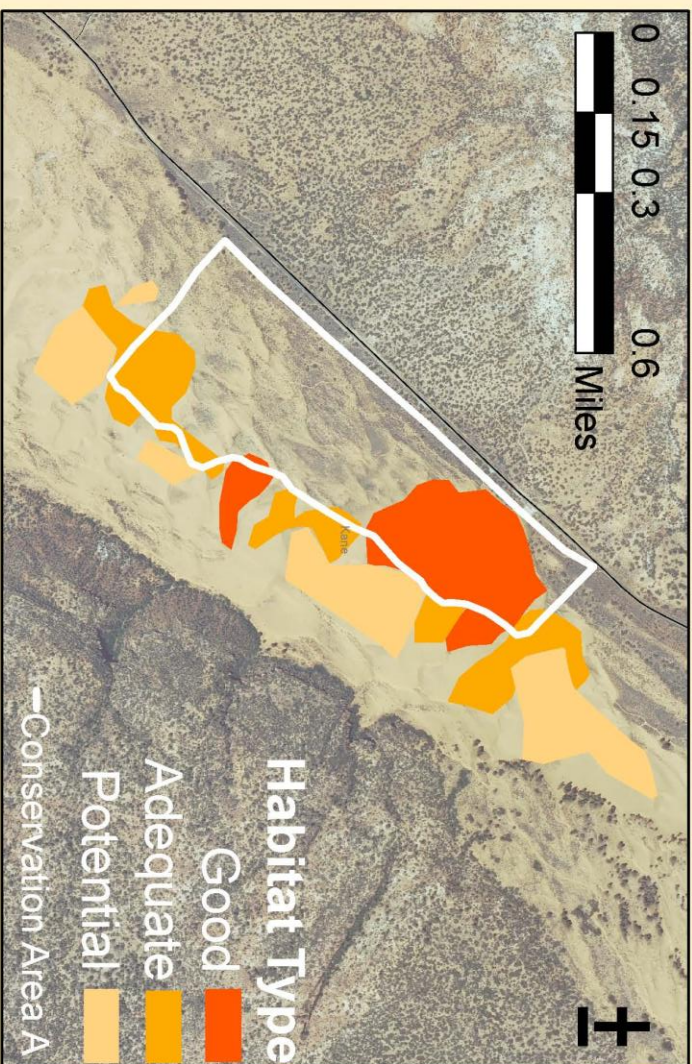
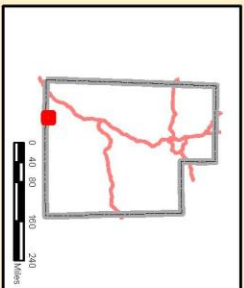
Personal Communications

Knisley, C.B. 2009b. Personal Communication: Telephone Conversation with Katherine Richardson on tiger beetle populations at CPSD. April 2009.

Coral Pink Sand Dunes



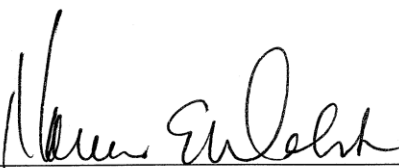
UTAH



Coral Pink Sand Dunes Tiger Beetle Habitat

Map Produced by: Katie Richardson
For Demonstration Purposes Only

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  5/26/10
Deputy Regional Director, Fish and Wildlife Service Date

Concur:  Date: October 22, 2010
ACTING Director, Fish and Wildlife Service

Do not concur: _____
Director, Fish and Wildlife Service Date